

**AMENDMENTS**  
**In the Claims**

**Current Status of Claims**

1      1.(**currently amended**)    An MRI coil apparatus comprising:

2                  four members, each member including a superconducting layer, where the members are  
3                  arranged to form a closed shape having four overlapping regions, where each overlapping region  
4                  comprises a capacitor formed from overlapping portions of the superconducting layer separated by  
5                  an overlapping region dielectric layer interposed therebetween,

6                  where two of the members are straight and two of the members are curvilinear to form a  
7                  closed saddle-shaped coil apparatus, and

8                  separating dielectric layers interposed between the superconducting layers at the overlapping  
9                  regions to form built-in capacitors.

1      2.(**currently amended**)    The apparatus of claim 1, wherein each member comprises further  
2                  including a substrate dielectric layer upon which the superconducting layer was formed, where the  
3                  dielectric layer of the straight members comprise a rigid dielectric material and the dielectric layer  
4                  of the curvilinear members comprise a flexible dielectric material.

1      3.(**currently amended**)    The apparatus of claim 2, wherein the superconducting layer of the  
2                  curvilinear members comprises a plurality of substantially flat superconducting segments substrate  
3                  dielectric layers are rigid.

1      4.(**currently amended**)    The apparatus of claim 2, wherein the end regions of the  
2                  superconducting layer of the curvilinear member comprise one of the substantially flat  
3                  superconducting segments two of the substrate dielectric layers are rigid and two of the substrate  
4                  dielectric layers are flexible.

1      5.(**currently amended**)    The apparatus of claim 4, wherein the overlapping region dielectric  
2                  layers comprise separate dielectric layers distinct from the substrate dielectric layers members are  
3                  straight.

1       6.(currently amended)     The apparatus of claims †5, wherein the substrate and the overlapping  
2       region dielectric layers are composed of the same or different dielectric material two of the members  
3       are straight and two of the members are curvilinear.

1       7.(canceled)

1       8.(currently amended)     The apparatus of claim †2, wherein the overlapping region dielectric  
2       layers comprise portions of the substrate dielectric layers of the members the substrate dielectric  
3       layers are the separating dielectric layers.

1       9.(currently amended)     The apparatus of claim 1, further comprising:

2              a metal layer formed on an exposed portion of a dielectric layer or an external dielectric layer  
3       formed form on an exposed portion of a superconducting layer with a metal layer formed on the  
4       outer surface of the external dielectric layer, where the metal layer forms a to form coupling or  
5       decoupling capacitive elements with a corresponding portion of the superconducting layer.

1       10.(currently amended)     The apparatus of claim 9, further comprising:

2              a wires bonded to the metal layers, where the metal wires are is adapted to link a plurality  
3       of the apparatuses together to form an arrays or to connect the apparatus to a pre-amplifier.

1       11.(currently amended)     A hybrid MRI coil apparatus comprising:

2              two elongated superconducting members legs, each member leg including a superconducting  
3       layer,

4              two metal members, and

5              separating dielectric layers,

6       where the superconducting members legs and the metal members are arranged to form a closed  
7       rectangular shape having four overlapping regions formed where the legs overlap the metal members  
8       at opposite faces of the metal members and where the separating dielectric layers are interposed  
9       between the superconducting layers legs and the faces of the metal members at the overlapping  
10      regions to form built-in capacitors.

1       **12.(currently amended)**     The apparatus of claim 11, wherein each superconducting member leg  
2       comprises further includes a substrate dielectric layer upon which the superconducting layer was  
3       formed.

1       **13.(currently amended)**     The apparatus of claim 12, wherein the substrate dielectric layers are  
2       is rigid.

1       **14.(currently amended)**     The apparatus of claim 12, wherein the separating dielectric layers  
2       comprise end portions of the substrate dielectric layers two of the substrate dielectric layers are rigid  
3       and two of the substrate dielectric layers are flexible.

1       **15.(currently amended)**     The apparatus of claim ~~11~~12, wherein the metal members comprise  
2       metal blocks and the separating dielectric layers comprise end portions of the substrate dielectric  
3       layers superconducting members are straight.

1       **16.(currently amended)**     The apparatus of claim ~~11~~12, wherein the metal members comprise  
2       metal blocks and the separating dielectric layers comprise a separate dielectric layers from the  
3       substrate dielectric layers superconducting members are curvilinear.

1       **17.(currently amended)**     The apparatus of claim 11, wherein each metal member includes a  
2       portion extending out past the legs and adapted to contact a metal ring superconducting members are  
3       arcuate.

1       **18.(currently amended)**     The apparatus of claim 11, wherein the metal blocks comprise  
2       protrusions form an inner surface of a top metal ring or a bottom metal ring substrate dielectric layers  
3       are the separating dielectric layers.

1       **19.(currently amended)**     The apparatus of 11, further comprising:  
2                  a metal layer formed on an exposed portion of a dielectric layer or an external dielectric layer  
3       formed form on an exposed portion of a superconducting layer with a metal layer formed on the  
4       outer surface of the external dielectric layer, where the metal layer forms a to form coupling or

5 decoupling capacitive elements with a corresponding portion of the superconducting layer.

1 20.(currently amended) The apparatus of claim 19, further comprising:

2 a wires bonded to the metal layers, where the metal wires are is adapted to link a plurality  
3 of the apparatuses together to form an arrays or to connect the apparatus to a pre-amplifier.

1 21.(currently amended) A birdcage-type resonator apparatus comprising:

2 a plurality of coils, apparatus each coil including:

3 four members, each member including a superconducting layer, where the members  
4 are arranged to form a closed shape having four overlapping regions, where each  
5 overlapping region comprises a capacitor formed from overlapping portions of the  
6 superconducting layers separated by an overlapping region dielectric layer interposed  
7 therebetween, and

8 where two of the members are straight and two of the members are curvilinear to  
9 form a closed saddle-shaped coil.

10 ~~separating dielectric layers interposed between the superconducting layers at the~~  
11 ~~overlapping regions to form built-in capacitors, and~~

12 ~~at least one small animal cavity,~~

13 where the coils apparatus are arranged around the to form at least one small animal cavity to permit  
14 MRI imaging of an animal placed within the cavity.

1 22.(currently amended) The apparatus of claim 21, wherein each member comprises further  
2 including a substrate dielectric layer upon which the superconducting layer was formed, where the  
3 dielectric layer of the straight members comprise a rigid dielectric material and the dielectric layer  
4 of the curvilinear members comprise a flexible dielectric material.

1 23.(currently amended) The apparatus of claim 2221, wherein the superconducting layer of the  
2 curvilinear members comprises a plurality of substantially flat superconducting segments substrate  
3 dielectric layers are rigid.

1 24.(currently amended) The apparatus of claim 2223, wherein the end regions of the

2       superconducting layer of the curvilinear member comprise one of the substantially flat  
3       superconducting segments two of the substrate dielectric layers are rigid and two of the substrate  
4       dielectric layers are flexible.

1       25.(currently amended)     The apparatus of 2+22, wherein the overlapping region dielectric layers  
2       comprise separate dielectric layers distinct from the substrate dielectrics members are straight.

1       26.(currently amended)     The apparatus of claims 2+25, wherein the substrate and the  
2       overlapping region dielectrics are composed of the same or different dielectric material two of the  
3       members are straight and two of the members are curvilinear.

1       27.(canceled)

1       28.(currently amended)     The apparatus of claims 21, wherein the overlapping region dielectric  
2       layers comprise portions of the substrate dielectric layers of the members the substrate dielectric  
3       layers are the separating dielectric layers.

1       29.(currently amended)     The apparatus of claims 21, further comprising:

2              a metal layer formed on an exposed portion of a dielectric layer or an external dielectric layer  
3       formed form on an exposed portion of a superconducting layer with a metal layer formed on the  
4       outer surface of the external dielectric layer, where the metal layer forms a to form coupling or  
5       decoupling capacitive elements with a corresponding portion of the superconducting layer.

1       30.(currently amended)     The apparatus of claim 29, further comprising:

2              a wires bonded to the metal layers, where the metal wires are is adapted to link a plurality  
3       of the apparatuses together to form an arrays or to connect the apparatus to a pre-amplifier.

1       31.(currently amended)     A birdcage-type resonator apparatus comprising:

2              a plurality of hybrid coils apparatus including:

3                  two elongated superconducting members legs, each member leg including a  
4                  superconducting layer,

5                   two metal members, and  
6                   separating dielectric layers, and

7                   at least one small animal cavity,

8                   where the coils apparatus are arranged around the to form at least one small animal cavity to permit  
9                   MRI imaging of an animal placed within the cavity and where the superconducting members legs  
10                  and the metal members are arranged to form a closed rectangular shape having four overlapping  
11                  regions, where the legs overlap the metal member at opposite faces thereof and where the separating  
12                  dielectric layers are interposed between the superconducting layers legs and the faces of the metal  
13                  members at the overlapping regions to form built-in capacitors.

1                   32.(currently amended)     The apparatus of claim 31, wherein each superconducting member leg  
2                   comprises further includes a substrate dielectric layer upon which the superconducting layer was  
3                   formed.

1                   33.(currently amended)     The apparatus of claim 32, wherein the substrate dielectric layers are  
2                   is rigid.

1                   34.(currently amended)     The apparatus of claim 32, wherein the separating dielectric layers  
2                   comprise end portions of the substrate dielectric layers two of the substrate dielectric layers are rigid  
3                   and two of the substrate dielectric layers are flexible.

1                   35.(currently amended)     The apparatus of claims 3+32, wherein the metal members comprise  
2                   metal blocks and the separating dielectric layers comprise end portions of the substrate dielectric  
3                   layers superconducting members are straight.

1                   36.(currently amended)     The apparatus of claims 3+32, wherein the metal members comprise  
2                   metal blocks and the separating dielectric layers comprise a separate dielectric layers from the  
3                   substrate dielectric layers superconducting members are curvilinear.

1                   37.(currently amended)     The apparatus of claims 31, wherein a top half of the metal members  
2                   comprise protrusions extending out from an inner surface of a top metal ring and a bottom half of

3           the metal members comprise protrusions extending out from an inner surface of a bottom ring, where  
4           the two rings are adapted to cool the metal members and the legs superconducting members are  
5           arcuate.

1       **38.(currently amended)**     The apparatus of claims 31, wherein the metal blocks include a portion  
2           that extends out past the legs and the apparatus further include a top ring and a bottom ring, where  
3           one portion of each coil is in contact with an inner surface of top ring and the other portion of each  
4           coil is in contact with an inner surface of the bottom ring and where the two rings are adapted to cool  
5           the metal members and the legs substrate dielectric layers are the separating dielectric layers.

1       **39.(currently amended)**     The apparatus of 31, further comprising:

2           a metal layer formed on an exposed portion of a dielectric layer or an external dielectric layer  
3           formed form on an exposed portion of a superconducting layer with a metal layer formed on the  
4           outer surface of the external dielectric layer, where the metal layer forms a to form coupling or  
5           decoupling capacitive elements with a corresponding portion of the superconducting layer.

1       **40.(currently amended)**     The apparatus of claim 39, further comprising:

2           a wires bonded to the metal layers, where the metal wires is are adapted to link a plurality  
3           of the apparatuses together to form an arrays or to connect the apparatus to a pre-amplifier.

1       **41.(currently amended)**     A small animal MRI apparatus comprising:

2           a vacuum housing including at least one cylindrical cavity aperture therethrough, where each  
3           aperture is adapted to receive a small animal,

4           a coolant reservoir including a coolant, a coolant inlet, a coolant outlet and a cold plate  
5           forming an internal end of the reservoir,

6           at least one resonator surrounding each cavity to permit MRI imaging of an animal in each  
7           of the cavities, where the resonator comprises comprising:

8           a plurality of coils apparatuses including:

9           four members, each member including a superconducting layer, where the  
10          members arranged to form a closed shape having four overlapping regions,  
11          and

12 \_\_\_\_\_ separating dielectric layers interposed between the superconducting layers at  
13 the overlapping regions to form built-in capacitors, and  
14 \_\_\_\_\_ at least one small animal cavity,  
15 where coil apparatuses are arranged to form a cylindrical structure so that a resonator surrounds each  
16 small animal cavity where the coil apparatus are arranged around cavity to permit MRI imaging of  
17 an animal placed within in the cavity each of the small animal cavities.

1 42.(currently amended) A small animal MRI apparatus comprising:  
2           a vacuum housing including at least one cylindrical cavity, where each cavity is adapted to  
3 receive a small animal,  
4           a coolant reservoir including a coolant, a coolant inlet, a coolant outlet and a cold plate  
5 forming an internal end of the reservoir,  
6           a plurality of coils positioned within the housing to permit MRI imaging of an animal placed  
7 in each of the cavities, where the each coil comprises:  
8           four members, each member including a superconducting layer, where the members  
9           are arranged to form a closed flat rectangular shape having four overlapping regions,  
10           and  
11           separating dielectric layers interposed between the superconducting layers at the  
12 overlapping regions to form built-in capacitors,  
13           where each coil is in thermal contact with the cold plate and where each cavities has at least  
14           three coils arranged in a triangular arrangement therearound.

1 43.(new) The apparatus of claim 41, wherein each coil apparatus comprises:  
2           four members, each member including a superconducting layer, where the members are  
3 arranged to form four overlapping regions, where each overlapping region comprises a capacitor  
4 formed from overlapping portions of the superconducting layer separated by an overlapping region  
5 dielectric layer interposed therebetween,  
6           where two of the members are straight and two of the members are curvilinear to form a  
7 closed saddle-shaped coil apparatus.

1 44.(new) The apparatus of claim 41, wherein each coil apparatus comprises:

2           two elongated superconducting legs, each leg including a superconducting layer,  
3           two metal members, and  
4           separating dielectric layers,  
5           where the superconducting legs and the metal members are arranged to form a closed rectangular  
6           shape having four overlapping regions formed where the legs overlap the metal members at opposite  
7           faces of the metal members and where the separating dielectric layers are interposed between the  
8           superconducting legs and the faces of the metal members to form built-in capacitors.